SPC BENCHMARK 1™
EXECUTIVE SUMMARY

X-IO TECHNOLOGIES
X-IO ISE 820 G3 ALL FLASH ARRAY

SPC-1 V1.14

Submitted for Review: March 10, 2015
Submission Identifier: A00155

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	X-IO Technologies – http://www.x-io.com Ken Bates – Kenneth.Bates@x-io.com 9950 Federal Drive, Suite 100 Colorado Springs, CO 80921 Phone: (719) 488-2466
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Revision Information and Key Dates

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SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	March 10, 2015
Date the FDR was submitted to the SPC	March 10, 2015
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	March 9, 2015

Tested Storage Product (TSP) Description

The ISE 820 G3 is a 3rd generation Intelligent Storage Element (ISE) from X-IO Technologies and is a revolutionary concept in data storage. The ISE 820 G3 is a Fibre Channel All-Flash Array (AFA) and is built on a perfectly balanced building block of performance, reliability, and scalability.

The ISE is a high-performance and highly reliable, flash-enabled storage system built for the demands of highly consolidated virtualization and VDI ecosystems, Database Management Systems and Cloud Service resources. Each ISE includes one or two sealed DataPacs (capacity modules) and dual Managed Reliability Controllers, which locally manage cache, data protection processes, and more. ISE can be configured to support both Fibre Channel and iSCSI connectivity protocols.

Developed over the course of a decade, at both Seagate and X-IO, by a core team of hardware and software designers and developers—with more than 350 patents to their collective credit—X-IO provides the basis of a carrier-grade, scale-out storage infrastructure. With a five- to seven-year operating lifespan, a standard 5-year no-cost warranty and performance that does not degrade as the system reaches 100% capacity utilization, the ISE delivers vastly superior TCO.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: X-IO ISE 820 G3 All Flash Array	
Metric	**Reported Result**
SPC-1 IOPS™	252,981.83
SPC-1 Price-Performance™	$0.32/SPC-1 IOPS™
Total ASU Capacity	2,920.578 GB
Data Protection Level	Protected 2 *(mirroring)*
Total Price	$81,732.74
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of **Total Price** to **SPC-1 IOPS™**.

Total ASU (Application Storage Unit) **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 2** using ***Mirroring*** configures two or more identical copies of user data..

> ***Protected 2:*** *The single point of failure of any* ***component*** *in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 9.

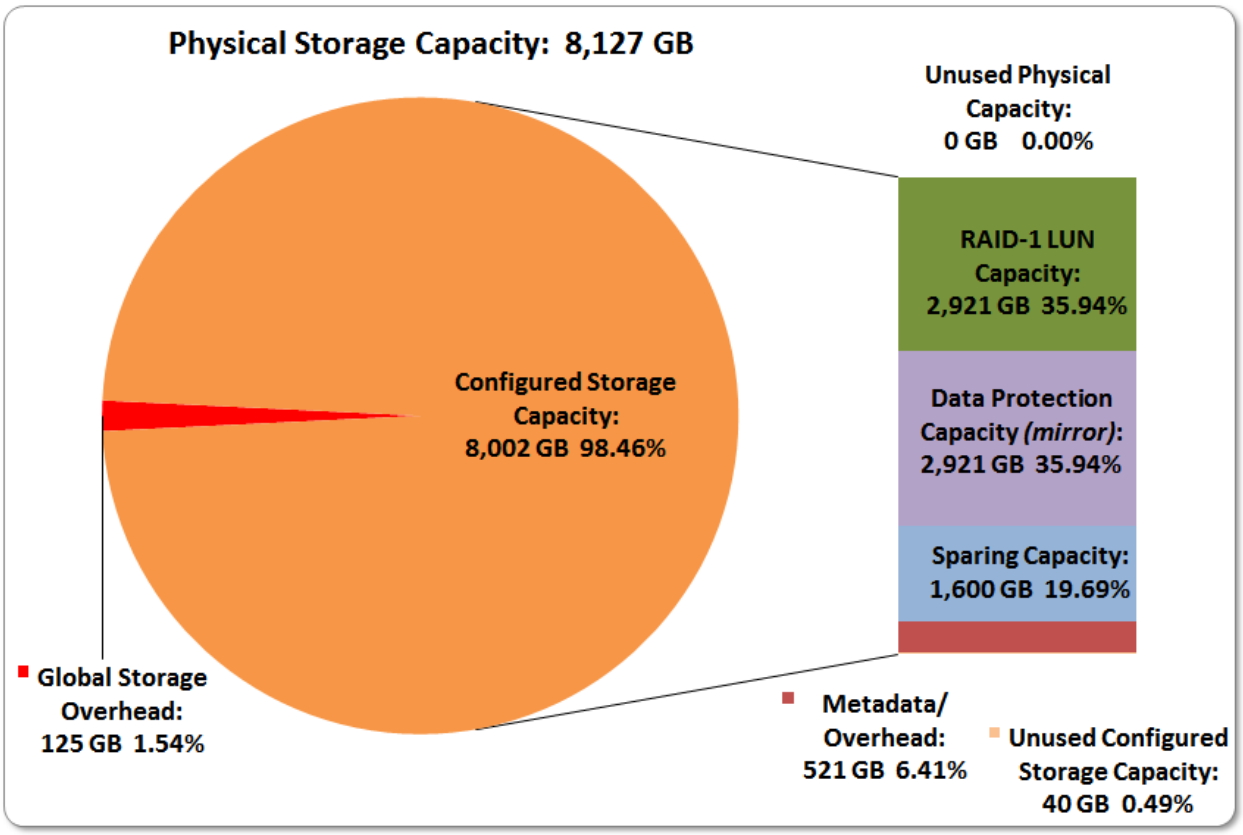
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

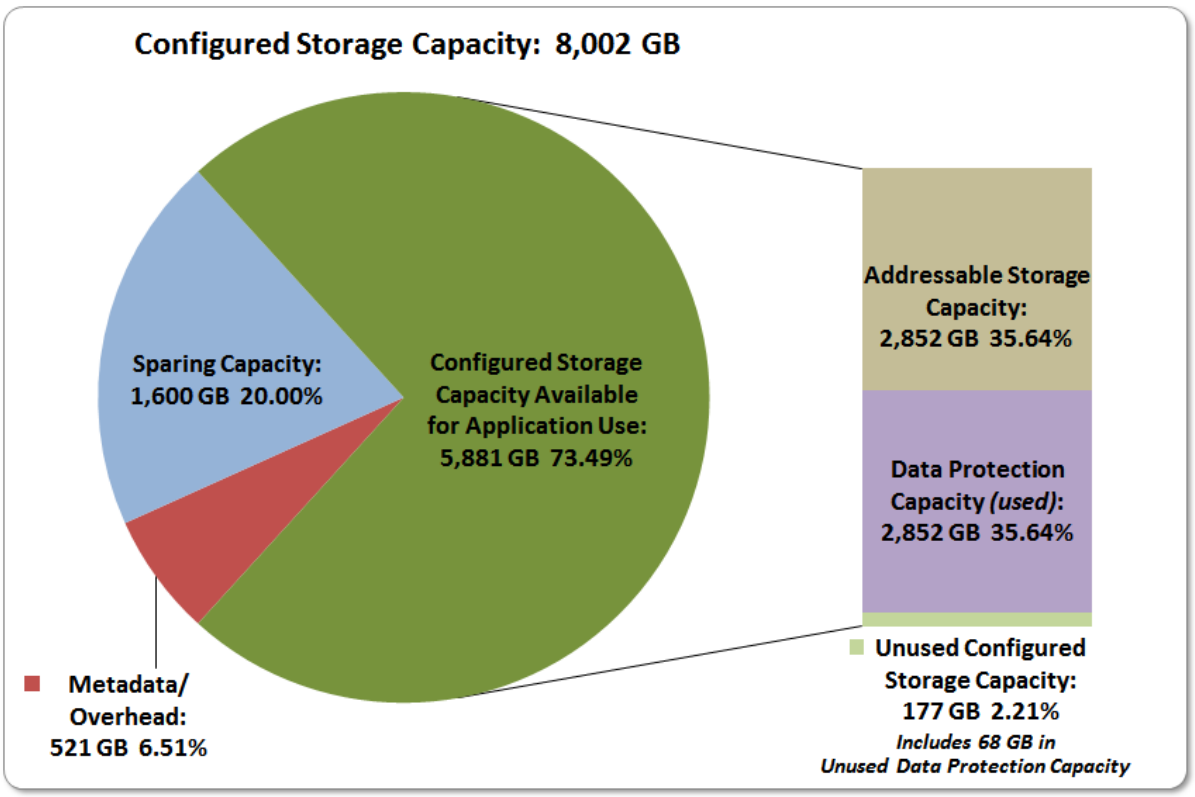
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

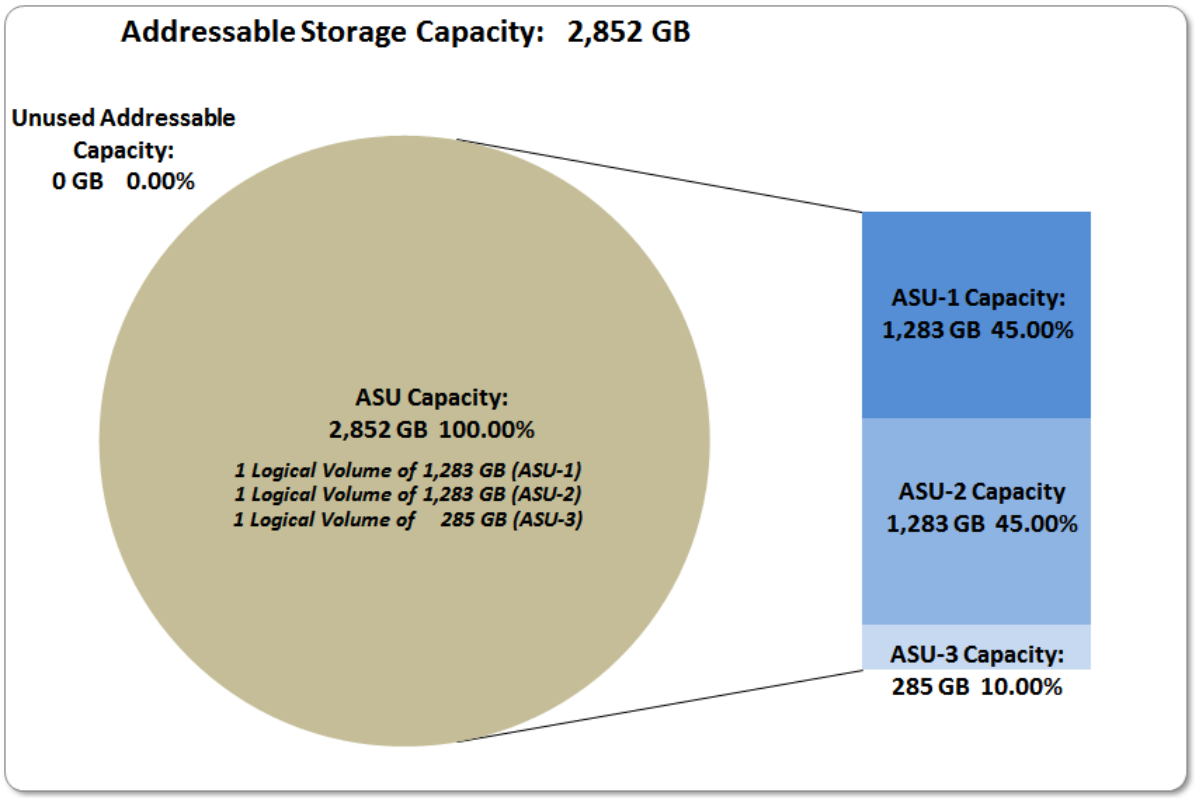
Storage Capacities, Relationships, and Utilization

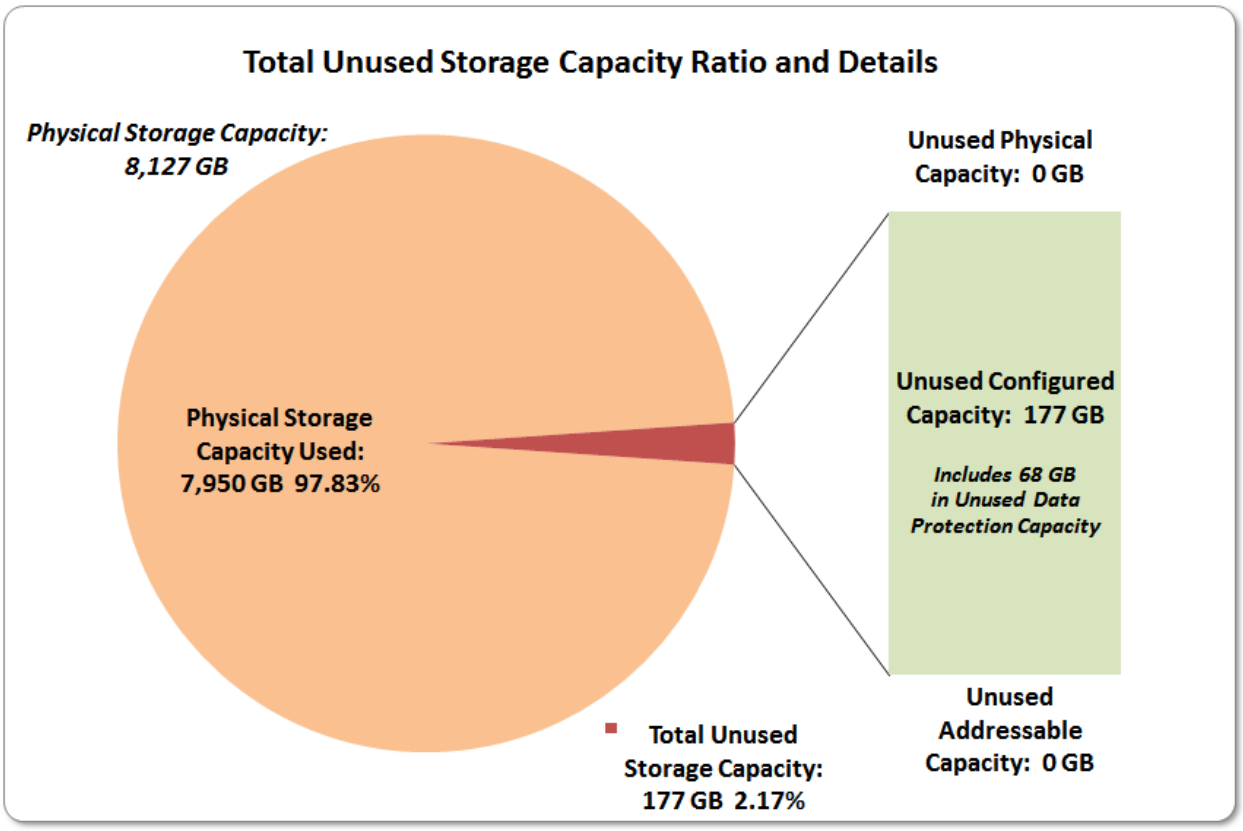
The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.

The capacity values in each of the following four charts are listed as integer values, for readability, rather than the decimal values listed elsewhere in this document.




Configured Storage Capacity: 8,002 GB
Sparing Capacity:
1,600 GB 20.00%
Configured Storage Capacity Available for Application Use:
5,881 GB 73.49%
Metadata/ Overhead:
521 GB 6.51%
Addressable Storage Capacity:
2,852 GB 35.64%
Data Protection Capacity (used):
2,852 GB 35.64%
Unused Configured Storage Capacity:
177 GB 2.21%
Includes 68 GB in Unused Data Protection Capacity


Addressable Storage Capacity: 2,852 GB
Unused Addressable Capacity:
0 GB 0.00%
ASU Capacity:
2,852 GB 100.00%
1 Logical Volume of 1,283 GB (ASU-1)
1 Logical Volume of 1,283 GB (ASU-2)
1 Logical Volume of 285 GB (ASU-3)
ASU-1 Capacity:
1,283 GB 45.00%
ASU-2 Capacity
1,283 GB 45.00%
ASU-3 Capacity:
285 GB 10.00%



SPC-1 Storage Capacity Utilization	
Application Utilization	35.09%
Protected Application Utilization	70.19%
Unused Storage Ratio	2.17%

Application Utilization: Total ASU Capacity *(2,852.127 GB)* divided by Physical Storage Capacity *(8,127.017 GB)*.

Protected Application Utilization: (Total ASU Capacity *(2,852.127 GB)* plus total Data Protection Capacity *(2,920.578vGB)* minus unused Data Protection Capacity *(68,451 GB)*) divided by Physical Storage Capacity *(8,127.017 GB)*.

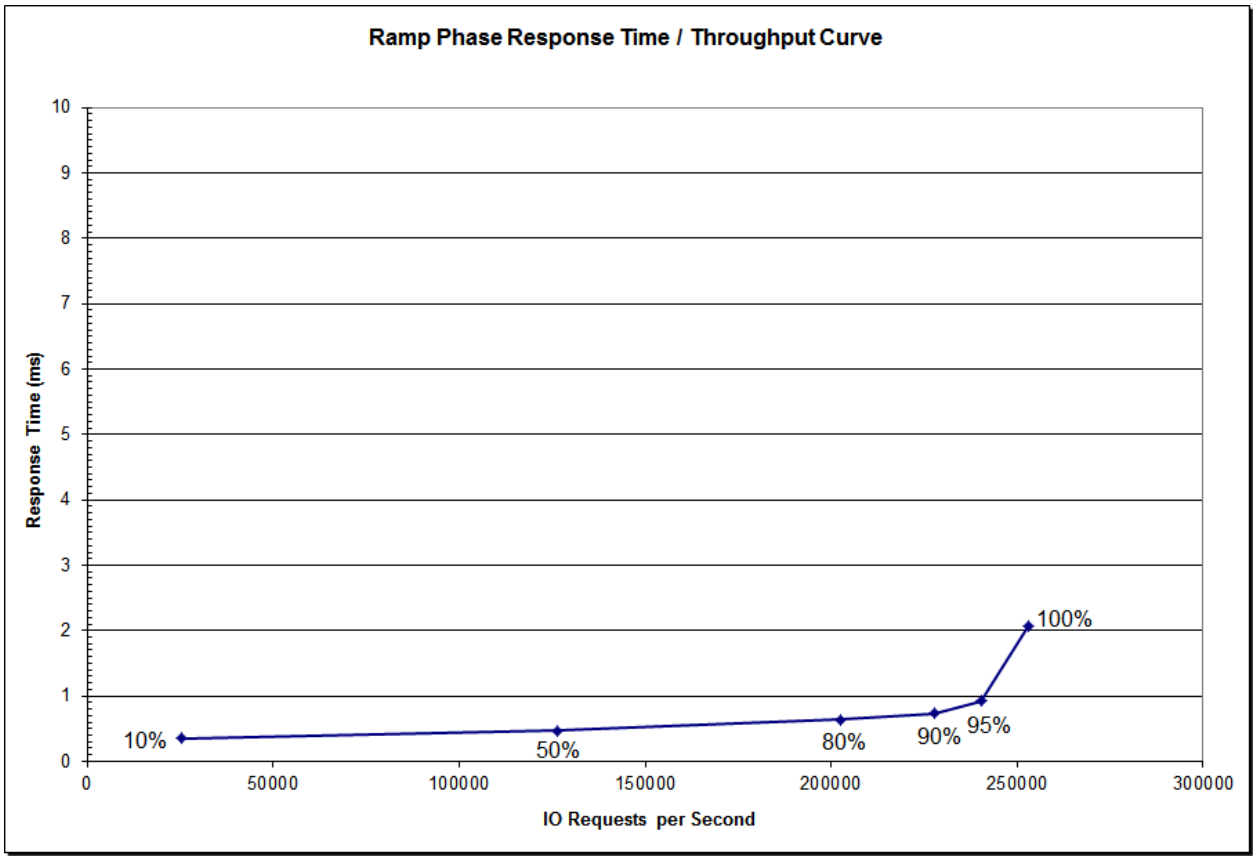
Unused Storage Ratio: Total Unused Capacity *(176.631 GB)* divided by Physical Storage Capacity *(8,127.017 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 23-24 in the Full Disclosure Report.

Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	25,311.33	126,227.48	202,389.16	227,691.75	240,336.97	252,981.83
Average Response Time (ms):						
All ASUs	0.35	0.46	0.64	0.73	0.93	2.06
ASU-1	0.36	0.47	0.64	0.73	0.91	1.98
ASU-2	0.35	0.48	0.65	0.74	0.93	2.03
ASU-3	0.34	0.44	0.64	0.74	0.97	2.24
Reads	0.37	0.51	0.67	0.76	0.92	1.90
Writes	0.34	0.44	0.62	0.72	0.94	2.16

Priced Storage Configuration Pricing

Qty	Name	Part Number	List Price	Discount	Unit price	Exteded Price
1	1 - ISE FC G3 Storage System Chassis 2 - ISE Manager Reliability Controllers each with: 4 - 4/8Gbps FC ports 40 - 6Gbps SAS connections 2 - ISE G3 All Flash DataPacs 20 - 200GB eMLC SSDs per DataPac	802820-000	$124,900.00	45.0%	$68,700.00	$68,700.00
4	Cable - 5m LC Duplex/LC Duplex Fiber Optic Patch Cord Cable - 5m LC Duplex/LC Duplex Fiber Optic Patch Cord	840056-000	$51.00	25.5%	$38.00	$152.00
2	QLogic - QLE2564CK 8Gb HBA Quad Port PCI Express	3rd party	$774.87		$774.87	$1,549.74
1	5 Year Hardware Warranty		$0.00	-	$0.00	$0.00
33	Software Maintenance - 1 month	020xxx-000	$190.00	10%	$171.00	$5,643.00
36	HW Maintenance - 1 month 4hr service uplift	020xxx-000	$175.00	10%	$158.00	$5,688.00
1	Software Warranty (90 Days)		$0.00	-	$0.00	$0.00
					Total	**$81,732.74**

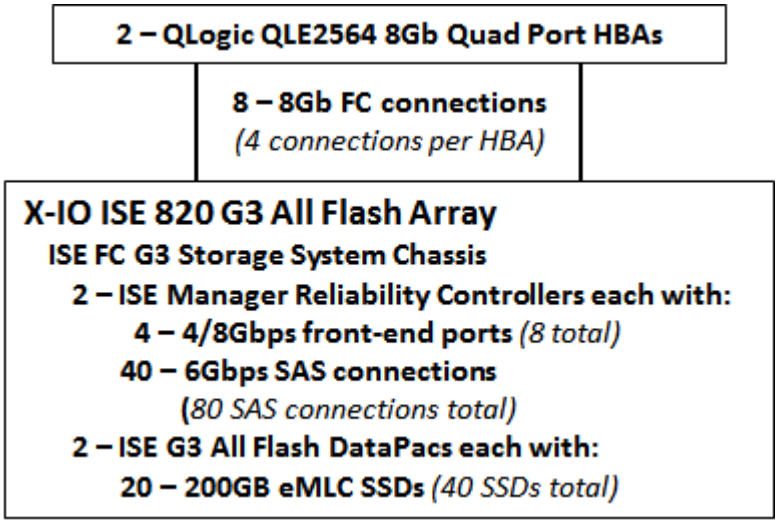
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems within four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the TSC and the Priced Storage Configuration.

Priced Storage Configuration Diagram



Priced Storage Configuration Components

Priced Storage Configuration:
2 – QLogic QLE2564 8Gb Quad Port HBAs
X-IO ISE 820 G3 All Flash Array 1 – ISE FC G3 Storage System Chassis 2 – ISE Manager Reliability Controllers, each with 4 – 4/8Gbps FC front-end port *(8 total and used)* 40 – 6Gbps SAS back-end connections (*80 total and used)* 2 – ISE G3 All Flash DataPacs 20 – 200GB eMLC SSDs per DataPac *(40 SSDs total)*